MPC Meets Disturbances and Uncertainties

Time:14:00-16:00, 27 August 2025 · Venue: WPT002, Loughborough University, UK

Abstract

Model Predictive Control (MPC) has established itself as a powerful and flexible framework for optimally controlling dynamic systems, ranging from conventional process control systems to emerging applications in robotics. While MPC has seen widespread success in academic settings, real-world deployment remains challenging due to the inevitable presence of disturbances and uncertainties. These may stem from external influences, sensor and actuator noise, model mismatches, or time-varying dynamics. If not properly addressed, such factors can compromise constraint satisfaction, degrade closed-loop performance, or even render the control problem infeasible.

At its core, MPC relies on receding horizon optimisation, which naturally incorporates new measurements at each time step. This enables the controller to react to changes in system behaviour—but often in a relatively passive manner, responding to disturbances and uncertainties rather than actively anticipating or rejecting them. This workshop explores strategies to enhance the robustness, adaptability, and practicality of MPC under such conditions.

Schedule

Time	Title	Speaker
14:00-14:30	*A New Framework for Offset-Free MPC in Robotic Physical Interaction*	**Yunda Yan** University College London Profile LinkedIn
14:30-15:00	*MPC with Parameter-Dependent Control Policies: Applications to Lateral Control of Single-Track Vehicles*	**James Fleming** Loughborough University Profile LinkedIn
15:00-15:30	*Sample-Based Predictive Control for Agile Robots: Fast Planning, Robust Execution, and Safe Operation*	**Valerio Modugno** University College London Profile LinkedIn
15:30-16:00	*Safety-Critical Control Under Disturbances: Foundation, Methods, and Robotic Applications*	**Jun Yang** Loughborough University Profile LinkedIn

Organisers

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Acknowledgements

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